MODIS Cloud Mask

Product Description

The MODIS Cloud Mask (MOD 35) is a daily, global Level 2 product generated at the 1-km and 250-m (at nadir) spatial resolution. The algorithm employs a series of visible and infrared threshold and consistency tests to specify confidence levels that an unobstructed view of the Earth's surface is observed. An indication of shadows affecting the scene is also provided. The 250-m cloud mask flags are based on the visible channel data only. Radiometrically accurate radiances are required, so holes in the Cloud Mask will appear wherever the input radiances are incomplete or of poor quality.

Research & Applications

A determination of the presence of global cloudiness is essential to the MODIS mission for two reasons. First, clouds play a critical role in the radiative balance of the Earth, and must be accurately described to assess climate and potential climate change. Second, the presence of cloudiness must be accurately determined to properly retrieve many atmospheric and surface parameters. For many of these retrieval algorithms even thin cirrus represents contamination.

Data Set Evolution

The MODIS cloud mask algorithm employs a battery of spectral tests, which use methodology applied for APOLLO, International Satellite Cloud Climatology Project (ISCCP), CLAVR, and SERCAA to identify cloudy FOVs. From these a clear-sky confidence level (> 99 percent, > 95 percent, > 66 percent, or < 1 percent) is assigned to each FOV. For inconclusive results, spatial and temporal variability tests are applied. The spectral tests rely on radiance (temperature) thresholds in the infrared and reflectance thresholds in the visible and near-infrared. Thresholds vary with surface type, atmospheric conditions (moisture, aerosol, etc.), and viewing geometry. Along with MOD 02 calibrated radiances, a 1-km land/water mask, DEM, ecosystem analysis, snow/ice cover map, NCEP analysis of surface temperature and wind speed, and an estimate of precipitable water will be required as inputs.

Cloud mask validation will be conducted using MAS data from several field campaigns, all-sky cameras, and comparison with NOAA operational instruments and other EOS AM-1 instruments such as ASTER.

Suggested Reading

Gao, B.-C., *et al.*, 1993.

Gustafson, G.B., *et al.*, 1994.

King, M.D., *et al.*, 1992.

Rossow, W.B. and L.C. Garder, 1993.

Saunders, R.W. and K.T. Kriebel, 1988.

Stowe, L.L., *et al.*, 1991.

MOD 35
PRODUCT SUMMARY

Coverage:
global

Spatial/Temporal Characteristics:
250 m and 1 km, daily

Key Science Applications:
cloud determination and screening, climate modeling, climate monitoring, increasing accuracy of other MODIS retrievals

Key Geophysical Parameters:
presence of cloud or shadow

Processing Level:
2

Product Type:
standard, at-launch

Science Team Contact:
P. Menzel

MODIS Cloud Mask

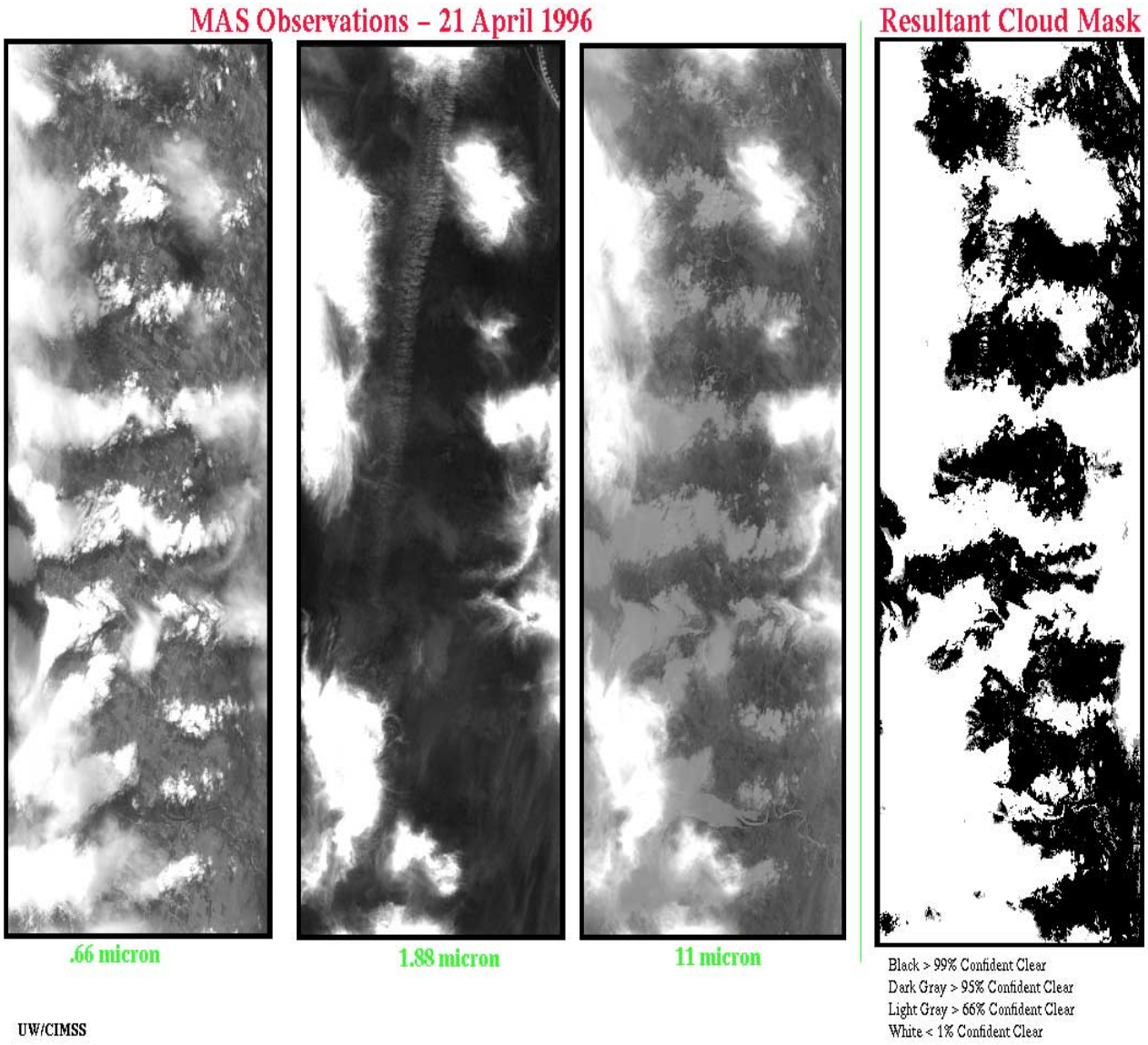

Figure 20. **Cloud Mask.** The three panels on the left represent MODIS Airborne Simulator (MAS) images acquired as part of NASA's Subsonic Assessment Program (SASS) over Oklahoma on 21 April 1996 at 0.66, 1.88, and 11.02 µm. The 1.88 µm channel is sensitive to water vapor absorption and is therefore similar in principle to the 1.38 µm channel that will be used by MODIS to detect the presence of high thin clouds. Each of these channels has difficulty in detecting a certain cloud type. For example, the 1.88 µm channel is least sensitive to the occurrence of low level cloud, while thin cirrus is difficult to detect using the 0.66 µm channel. The final panel is the resultant cloud mask image. Most of the scene is classified as either high confident clear (black) or high confident cloudy (white).